

## PRODUCTION OF GEL TC-99M GENERATORS FOR NUCLEAR MEDICINE (CPR/2/006) G5

### CORE FINANCING

YEAR	Experts		Equipment	Fellowships		Scientific Visits		Training	Sub-contracts	Misc. Comp.	Total
	m/d	US \$	US \$	m/d	US \$	m/d	US \$	US \$	US \$	US \$	US \$
1995	1/0	11,400	55,000	-	-	-	-	-	-	-	66,400
1996	1/0	12,000	-	-	-	-	-	-	-	-	12,000

First Year Approved: 94

Total expenditure to 30 September 1994:

\$140,825 (TACF)

**OBJECTIVES:** To complete the development of a method of producing technetium generators by irradiating stable molybdenum rather than by fission of uranium, and to establish a production process sufficient to meet the demand in the southwestern part of China.

**BACKGROUND:** The isotope technetium-99, which is widely used as a tracer element in nuclear medicine, is obtained at the place where it is needed from its "generator", Mo-99, by a simple chemical extraction process. Mo-99 itself is commonly produced through fission of uranium. This process produces generators of excellent quality which are the recognized

standard worldwide. However, the process is also inherently very expensive, technically very sophisticated, and, because fission is involved, it also produces very large amounts of high level waste. These characteristics essentially prevent developing countries from having a local supply of generators, and this in turn limits the extent to which an important nuclear medicine technique can be utilized in these countries. The Nuclear Power Institute of China (NPIC) has been developing an alternative method of producing Mo-99 generators which does not involve fission and therefore does not have the above disadvantages. The process is based on irradiating a stable form of molybdenum in a research reactor. After irradiation and processing, the generator is held in a special gel until the technetium isotope is needed. Use in over 100 hospitals in China indicates that the Tc-99 tracers obtained in this way give clinical results which are equivalent to those obtained from the fission process. Some additional development is required if the generators produced by the gel process are to become as readily acceptable as those made by the fission process. Improved performance in the extraction process and a reduction in contamination of the product with molybdenum are necessary. Gel production must also become more consistent, and the production process must be improved to the point where generators are produced in much larger quantities.

**PROJECT PLAN:** The immediate objective will be to upgrade generator quality and to optimize the existing facilities to the extent necessary to meet generator demand in the southwestern part of China. Another task of equal importance is a series of comparative studies and independent assessments of the results. These studies will be designed to establish whether the quality of the generators obtained using the gel technology is less than, comparable to, or better than that of generators produced using the standard fission process. Ultimately, when the gel technology has been independently verified to meet international standards, it will be available for transfer to other developing countries.

**NATIONAL COMMITMENT:** The Government has approved the plan and raised the project to the level of a "national key project". The Government and NPIC together have invested the equivalent of \$150,000 in research and development to date. The estimated cost of modifications to and expansion of the production line is \$300,000, and the Government has allocated these funds. The required operating budget of \$120,000 per year will also be provided. NPIC has two research reactors available as needed for the irradiation. Existing hot cell facilities will be reconditioned for the project, and relevant products and materials will be provided. Nine scientists and technicians will be assigned full-time to the project.

**AGENCY INPUT:** Expert services to assist with improvement of the extraction process; a limited amount of equipment.

**IMPACT:** China currently imports approximately 1800 fission-produced Tc-99 generators each year. According to projections of demand, without the proposed expansion of capacity, imports would have to be increased by a factor of five by the year 2000. The primary impact of the proposed project is therefore the resulting improvements in health services to the population, specifically the bone scans, liver scans and similar diagnostic interventions, for an estimated 500,000 patients each year that would otherwise never be carried out. The loss of productive capacity that is avoided by being able to provide such treatments to millions of individuals is enormous. Savings in hard currency that would be realized by eliminating generator imports is also significant. The total potential impact of the project must take into account *not only the direct results in China but also that which would result from the possible transfer of the gel technology to other developing countries.*